

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A magnetic transduction sensor device, of the type comprising at least one magnetic layer ~~(22; 32; 42; 122)~~ configured to determine a variable magnetisation (MF) in response to the variation of a physical quantity (P, T), ~~characterised in that~~ wherein said device ~~(20; 30; 40; 50; 120)~~ comprises a plurality of layers ~~(11, 12, 13, 14, 15, 16, 17)~~ arranged in a stack, said magnetic layer ~~(22; 32; 42; 122)~~ configured to determine a variable magnetisation (MF), in response to the variation of a physical quantity (P, T) interacting magnetically through said variable magnetisation (MF) with a free magnetic layer ~~(11)~~, able to be associated with a temporary magnetisation (MT), said free magnetic layer ~~(11)~~ belonging to said plurality of layers ~~(11, 12, 13, 14, 15, 16, 17)~~, which further comprises at least one spacer layer (13) and a permanent magnetic layer (12) associated to a permanent magnetisation (MP),

wherein said physical quantity (P, T) is a pressure (P) and in that said sensor device further comprises a compressible layer and in that said magnetic layer configured to determine a variable magnetisation (M) in response to the variation of a physical quantity (P, T) comprises a layer with high magnetic coercivity, said compressible layer and layer with high magnetic coercivity being associated with said plurality of layer, and

wherein said compressible layer is obtained by and comprises a polymer, elastomer or gel, which is compressible by applying a pressure and which behaves in resilient fashion.

2. (cancelled)

3. (currently amended) Device as claimed in claim 12, ~~characterised in that~~ wherein said compressible layer ~~(21; 31; 42)~~ is laid onto the free magnetic layer ~~(11)~~

and said layer with high magnetic coercivity (~~22; 32; 42~~) is laid onto said compressible layer(~~21~~).

4. (currently amended) Device as claimed in claim 3, ~~characterised in that~~wherein said compressible layer (~~21; 31; 42~~) has such an uncompressed thickness (D) as to prevent the layer with high magnetic coercivity (~~22~~) from switching the temporary magnetisation (MT) associated with said free magnetic layer(~~11~~).

5. (currently amended) Device as claimed in claim 4, ~~characterised in that~~wherein said layer with high magnetic coercivity (~~32; 42~~) is obtained by means of a composite structure (~~34~~) comprising magnetic particles (~~33~~) contained in a resilient matrix(~~35~~).

6. (currently amended) Device as claimed in claim 5, ~~characterised in that~~wherein said plurality of layers (~~11, 12, 13, 14, 15, 16, 17~~) comprises a substrate(~~14~~), in turn comprising a recess (~~36~~) into which said sensor device (~~40, 50~~) is laid.

7. (currently amended) Device as claimed in claim 5, ~~characterised in that~~wherein said layer with high coercivity (~~32~~) contains the compressible layer(~~31~~) which is in the form of gel or foam or liquid.

8. (currently amended) Device as claimed in claim 5, ~~characterised in that~~wherein said layer with high magnetic coercivity (~~32; 42~~) comprising magnetic particles (~~33~~) contained in a resilient matrix is able to perform also the function of compressible layer(~~42~~).

9. (currently amended) Device as claimed in claim 12, ~~characterised in that~~wherein the compressible layer (~~21; 32; 42~~) is obtained by means of a porous composite material.

10. (currently amended) Device as claimed in claim 1, ~~characterised in that~~wherein said plurality of layers (~~11, 12, 13, 14, 15, 16, 17~~) arranged in a stack configures a spin valve magnetic device(~~10~~).

11. (currently amended) Device as claimed in claim 1, ~~characterised in that~~wherein it is associated to a pressure monitoring and/or restoring system of a tyre (52)-positioned on a wheel-(50), said system comprising a control unit (56)-and one or more actuators (52)-for blowing air into the tyre-(52).

12. (currently amended) Manufacturing process of a pressure sensor device as claimed in claim 1, ~~characterised in that~~wherein it provides for depositing said compressible layer (21; 31)-by means of a spinning process and/or by means of a casting process and/or by evaporation.

13. (currently amended) Manufacturing process as claimed in claim 12, ~~characterised in that~~wherein it provides for depositing said magnetic layer with high coercivity (22; 32; 42)-by means of evaporation and/or electroplating techniques with electrochemical cell.

14. – 23. (cancelled)

24. (currently amended) Detection process of a physical quantity by magnetic transduction, employing the device as claimed in claim 1.

25. (currently amended) Detection process as claimed in claim 24, ~~characterised in that~~wherein said physical quantity is a pressure (P) and in that the method comprises the following operations:

- ~~realising~~realizing said compressible layer (21; 31)-with an uncompressed thickness (D) exceeding a threshold thickness ( $D_{th}$ ) below which the layer with high coercivity (22; 32; 42)-influences the magnetisation (MT) of the free magnetic layer (11);
- forcing an electrical current (I) in said sensor device (20; 30, 40, 50);
- measuring the value of the electrical resistance of said sensor device (20; 30, 40, 50)-as a function of the values assumed by the pressure (P).

26. (currently amended) Process as claimed in claim 25, ~~characterised in that~~wherein it associates a pressure threshold ( $P_{th}$ ) to said threshold thickness ( $D_{th}$ ).

27. – 28. (cancelled)

29. (new) A magnetic transduction sensor device, of the type comprising at least one magnetic layer configured to determine a variable magnetisation (MF) in response to the variation of a physical quantity (P, T), wherein said device comprises a plurality of layers arranged in a stack, said magnetic layer configured to determine a variable magnetisation (MF), in response to the variation of a physical quantity (P, T) interacting magnetically through said variable magnetisation (MF) with a free magnetic layer, able to be associated with a temporary magnetisation (MT), said free magnetic layer belonging to said plurality of layers, which further comprises at least one spacer layer and a permanent magnetic layer associated to a permanent magnetisation (MP),

wherein said physical quantity (P, T) is a temperature (T), and

wherein said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T) is a layer with low Curie temperature ( $T_c$ ).

30. (new) Device as claimed in claim 29, wherein said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T) is laid over the free magnetic layer.

31. (new) Device as claimed in claim 29, wherein it comprises a permanent magnetic layer with low saturation deposited over said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T).

32. (new) Device as claimed in claim 31, wherein it comprises a second spacer layer to separate the free magnetic layer from said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T).

33. (new) Device as claimed in claim 29, wherein it comprises a third spacer layer to separate said permanent magnetic layer with low saturation from said magnetic

layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T).

34. (new) Device as claimed in claim 29, wherein said permanent magnetic layer with low saturation and/or said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T) are obtained by means of a composite structure comprising magnetic particles contained in a matrix.

35. (new) Device as claimed in claim 29, wherein said plurality of layers arranged in a stack configures a spin valve magnetic device .

36. (new) A process for manufacturing a temperature sensor device as claimed in claim 29, wherein it provides for depositing a permanent magnetic layer with low saturation and/or said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T) through a thin film plating process, in particular a process of thermal evaporation and/or electro-plating in Galvanic cell and/or casting and/or spinning.

37. (new) Process as claimed in claim 36, wherein said thin film plating process comprises, relatively to said magnetic layer able to vary a magnetisation associated therewith in response to a temperature (T) the plating of a composite structure of magnetic particles in a matrix and to adjust the composition of said composite structure as a function of the Curie temperature ( $T_c$ ) to be obtained.

38. (new) Detection process of a physical quantity by magnetic transduction, employing the device as claimed in claim 29.

39. (new) Detection process of a physical quantity as claimed in claim 29, wherein said physical quantity is a temperature and in that the method comprises the following operations:

- providing a layer with low Curie temperature ;
- associating said layer with low Curie temperature to a spin valve device in such a configuration that a magnetisation (MF) associated with the ferromagnetic state

of said layer with low Curie temperature influences a temporary magnetisation (MT) associated to the free magnetic layer of said spin valve ;

- forcing an electrical current (I) in said sensor device ;
- measuring the value of the electrical resistance of said sensor device as a function of the values assumed by the pressure (T).

40. (new) Method as claimed in claim 39, wherein it provides a permanent magnetic layer with low saturation able to induce magnetisation (MF) in the layer when said magnetisation (MF) is lost as a result of a transition above the Curie temperature ( $T_0$ ).

41. (new) A magnetic transduction sensor device, of the type comprising at least one magnetic layer configured to determine a variable magnetisation (MF) in response to the variation of a physical quantity (P, T), wherein said device comprises a plurality of layers arranged in a stack, said magnetic layer configured to determine a variable magnetisation (MF), in response to the variation of a physical quantity (P, T) interacting magnetically through said variable magnetisation (MF) with a free magnetic layer, able to be associated with a temporary magnetisation (MT), said free magnetic layer belonging to said plurality of layers, which further comprises at least one spacer layer and a permanent magnetic layer associated to a permanent magnetisation (MP),

wherein said physical quantity (P, T) is a pressure (P) and in that said sensor device further comprises a compressible layer and in that said magnetic layer configured to determine a variable magnetisation (M) in response to the variation of a physical quantity (P, T) comprises a layer with high magnetic coercivity, said compressible layer and layer with high magnetic coercivity being associated with said plurality of layer ,

wherein said compressible layer is laid onto the free magnetic layer and said layer with high magnetic coercivity is laid onto said compressible layer (21),

wherein said compressible layer has such an uncompressed thickness (D) as to prevent the layer with high magnetic coercivity from switching the temporary magnetisation (MT) associated with said free magnetic layer ,

wherein said layer with high magnetic coercivity is obtained by means of a composite structure comprising magnetic particles contained in a resilient matrix, and wherein said layer with high coercivity contains the compressible layer which is in the form of gel or foam or liquid.

42. (new) Device as claimed in claim 41, wherein said plurality of layers comprises a substrate, in turn comprising a recess into which said sensor device is laid.

43. (new) Device as claimed in claim 41, wherein said layer with high magnetic coercivity comprising magnetic particles contained in a resilient matrix is able to perform also the function of compressible layer.

44. (new) Device as claimed in claim 41, wherein the compressible layer is obtained by means of a porous composite material.

45. (new) Device as claimed in claim 41, wherein said plurality of layers arranged in a stack configures a spin valve magnetic device .

46. (new) Device as claimed in claim 41, wherein it is associated to a pressure monitoring and/or restoring system of a tyre positioned on a wheel, said system comprising a control unit and one or more actuators for blowing air into the tyre.

47. (new) Manufacturing process of a pressure sensor device as claimed in claim 41, wherein it provides for depositing said compressible layer by means of a spinning process and/or by means of a casting process and/or by evaporation.

48. (new) Manufacturing process as claimed in claim 47, wherein it provides for depositing said magnetic layer with high coercivity by means of evaporation and/or electroplating techniques with electrochemical cell.

49. (new) Detection process of a physical quantity by magnetic transduction, employing the device as claimed in claim 41.

50. (new) Detection process as claimed in claim 49, wherein said physical quantity is a pressure (P) and in that the method comprises the following operations:

- realising said compressible layer with an uncompressed thickness (D) exceeding a threshold thickness ( $D_{th}$ ) below which the layer with high coercivity influences the magnetisation (MT) of the free magnetic layer ;
- forcing an electrical current (I) in said sensor device;
- measuring the value of the electrical resistance of said sensor device as a function of the values assumed by the pressure (P).

51. (new) Process as claimed in claim 50, wherein it associates a pressure threshold ( $P_{th}$ ) to said threshold thickness ( $D_{th}$ ).

52. (new) A magnetic transduction sensor device, of the type comprising at least one magnetic layer configured to determine a variable magnetisation (MF) in response to the variation of a physical quantity (P, T), wherein said device comprises a plurality of layers arranged in a stack, said magnetic layer configured to determine a variable magnetisation (MF), in response to the variation of a physical quantity (P, T) interacting magnetically through said variable magnetisation (MF) with a free magnetic layer, able to be associated with a temporary magnetisation (MT), said free magnetic layer belonging to said plurality of layers, which further comprises at least one spacer layer and a permanent magnetic layer associated to a permanent magnetisation (MP),

wherein said physical quantity (P, T) is a temperature (T), and

wherein said permanent magnetic layer with low saturation and/or said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T) are obtained by means of a composite structure comprising magnetic particles contained in a matrix.

53. (new) Device as claimed in claim 52, wherein said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T) is laid over the free magnetic layer .

54. (new) Device as claimed in claim 53, wherein said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T) is a layer with low Curie temperature ( $T_c$ ).

55. (new) Device as claimed in claim 54, wherein it comprises a permanent magnetic layer with low saturation deposited over said magnetic layer configured to determine a variable magnetisation (MF) in response to the variation in temperature (T).

56. (new) Device as claimed in claim 55, wherein it comprises a second spacer layer to separate the free magnetic layer from said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T).

57. (new) Device as claimed in claim 54, wherein it comprises a third spacer layer to separate said permanent magnetic layer with low saturation from said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T).

58. (new) Device as claimed in claim 52, wherein said plurality of layers arranged in a stack configures a spin valve magnetic device .

59. (new) A process for manufacturing a temperature sensor device as claimed in claim 52, wherein it provides for depositing a permanent magnetic layer with low saturation and/or said magnetic layer configured to determine a variable magnetisation (MF) in response to the temperature variation (T) through a thin film plating process, in particular a process of thermal evaporation and/or electro-plating in Galvanic cell and/or casting and/or spinning.

60. (new) Process as claimed in claim 59, wherein said thin film plating process comprises, relatively to said magnetic layer able to vary a magnetisation associated therewith in response to a temperature (T) the plating of a composite structure of magnetic particles in a matrix and to adjust the composition of said composite structure as a function of the Curie temperature ( $T_c$ ) to be obtained.

61. (new) Detection process of a physical quantity by magnetic transduction, employing the device as claimed in claim 52.

62. (new) Detection process of a physical quantity as claimed in claim 61, wherein said physical quantity is a temperature and in that the method comprises the following operations:

- providing a layer with low Curie temperature ;
- associating said layer with low Curie temperature to a spin valve device in such a configuration that a magnetisation (MF) associated with the ferromagnetic state of said layer with low Curie temperature influences a temporary magnetisation (MT) associated to the free magnetic layer of said spin valve ;
- forcing an electrical current (I) in said sensor device ;
- measuring the value of the electrical resistance of said sensor device as a function of the values assumed by the pressure (T).

63. (new) Method as claimed in claim 62, wherein it provides a permanent magnetic layer with low saturation able to induce magnetisation (MF) in the layer when said magnetisation (MF) is lost as a result of a transition above the Curie temperature ( $T_0$ ).